Design Review
for
Multiple Project Support

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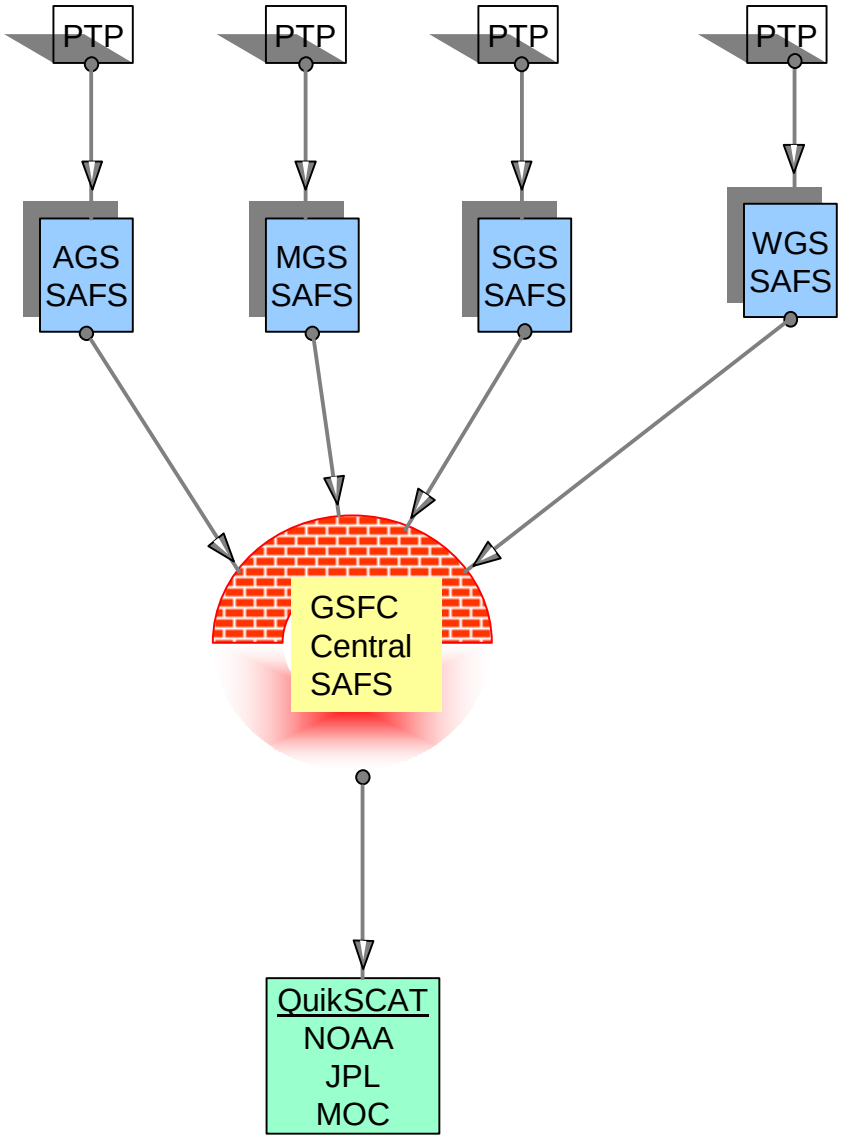
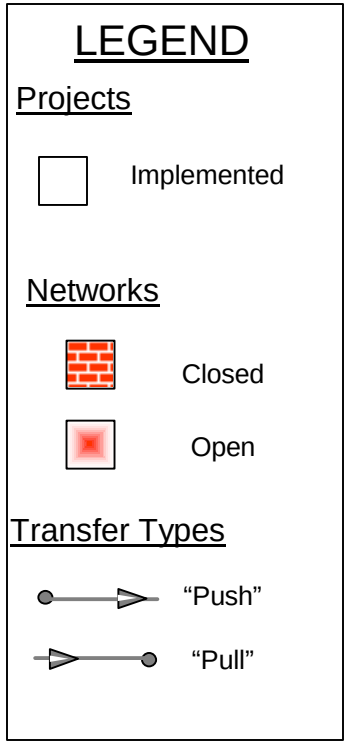
URL: http://www.wff.nasa.gov/~web/safs/

SAFS: Schedule

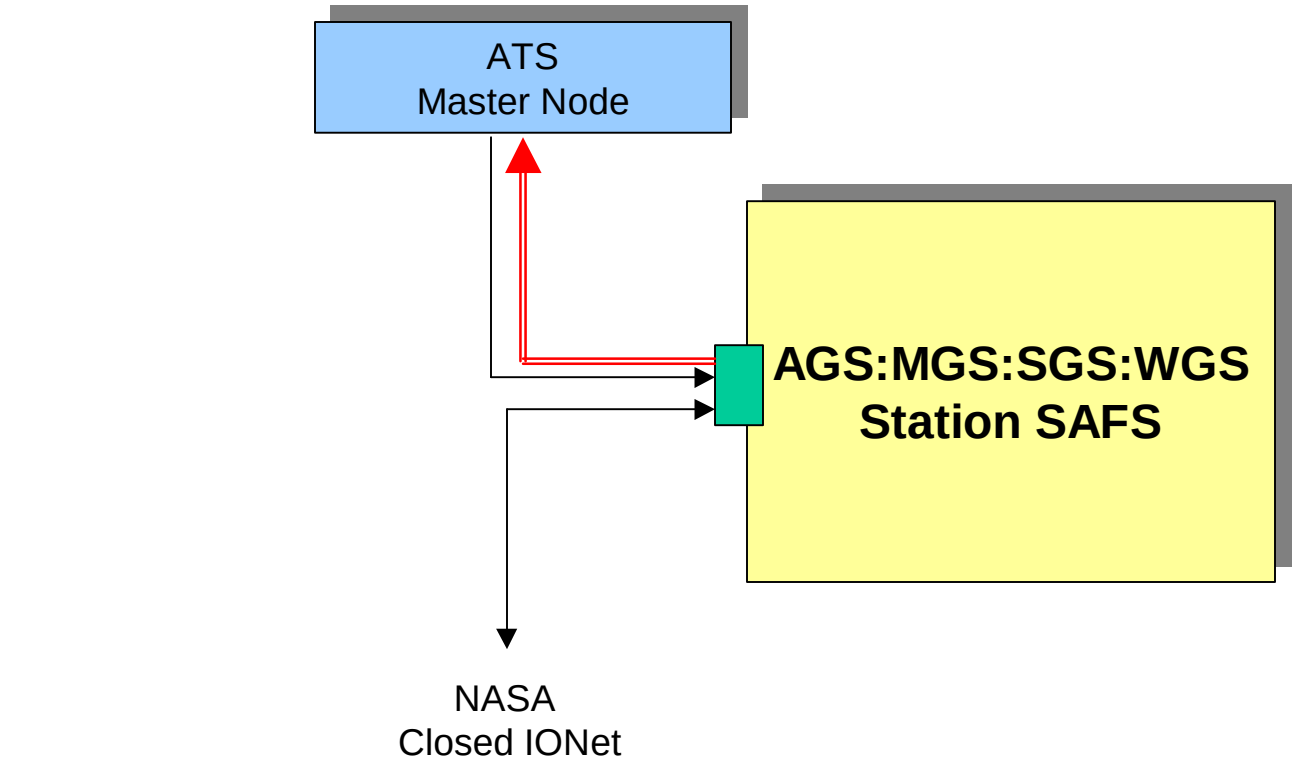
ID	% Done	Task Name	Start	Finish
1	**100%**	**SAFS Version 1.0 (Single Project Ready)**	**6/25/97**	**8/1/98**
2	100%	Conduct a peer design review for SAFS	1/7/98	1/7/98
3	100%	Design, setup, and test a prototype system in a lab environment	6/25/97	3/27/98
17	100%	Setup and test Ground Station SAFS at WPS	1/2/98	3/27/98
18	100%	Setup Central SAFS at GSFC/test with WPS SAFS	1/2/98	3/27/98
24	100%	Setup and test Ground Station SAFS at AGS/test with Central SAFS	1/16/98	4/24/98
25	100%	Setup and test Ground Station SAFS at SGS/test with Central SAFS	1/16/98	5/15/98
26	100%	Developmental Testing (manual, automated, saturation)	5/18/98	7/31/98
27	100%	Demonstrate SAFS with PTP at WPS and Central SAFS	6/15/98	6/30/98
28	100%	QuikSCAT Science and Housekeeping Data Flow Test	6/1/98	7/31/98
29	100%	SAFS operational	8/1/98	8/1/98
30	**44%**	**SAFS Version 2.0 (Multiple Project Ready)**	**9/1/98**	**3/31/00**
31	75%	Determine process for manual addition of projects	9/1/98	8/31/99
32	43%	Prioritize simultaneous file transmission requests	9/1/98	10/29/99
33	37%	Expand reporting and statistics web page	9/1/98	12/31/99
34	10%	Design Review	7/13/99	7/13/99
35	14%	Determine/procure/install system upgrades for faster throughput	6/1/99	12/31/99
36	54%	Implement SAGE III	1/8/99	11/29/99
40	14%	Implement EO-1	4/12/99	10/28/99
46	48%	Implement ADEOS II	9/1/98	3/31/00
47	100%	Determine telemetry processor interface requirements for ADEOSII	9/1/98	5/31/99
48	70%	Procure additional hardware as determined	6/1/99	7/30/99
49	0%	Submit CCR/Install and test procured hardware	8/2/99	8/23/99
50	0%	Submit CCR/Implement manual project addition	6/1/99	8/13/99
51	0%	Setup Ground Station SAFS at ASF (involves travel to ASF)	8/24/99	9/20/99
52	0%	Test data acquisition at ASF and WGS/test with Central SAFS at GSFC	9/21/99	3/31/00
53	**25%**	**SAFS Version 3.0 (Operational Management)**	**9/1/98**	**3/31/00**
54	0%	Automate project additions/changes/deletions to systems and web reports	9/1/99	3/31/00
57	15%	Streaming of web data for "quick look" status	3/15/99	3/31/00
58	40%	Operational Support	9/1/98	3/31/00
61				

SAFS: Single Project Configuration

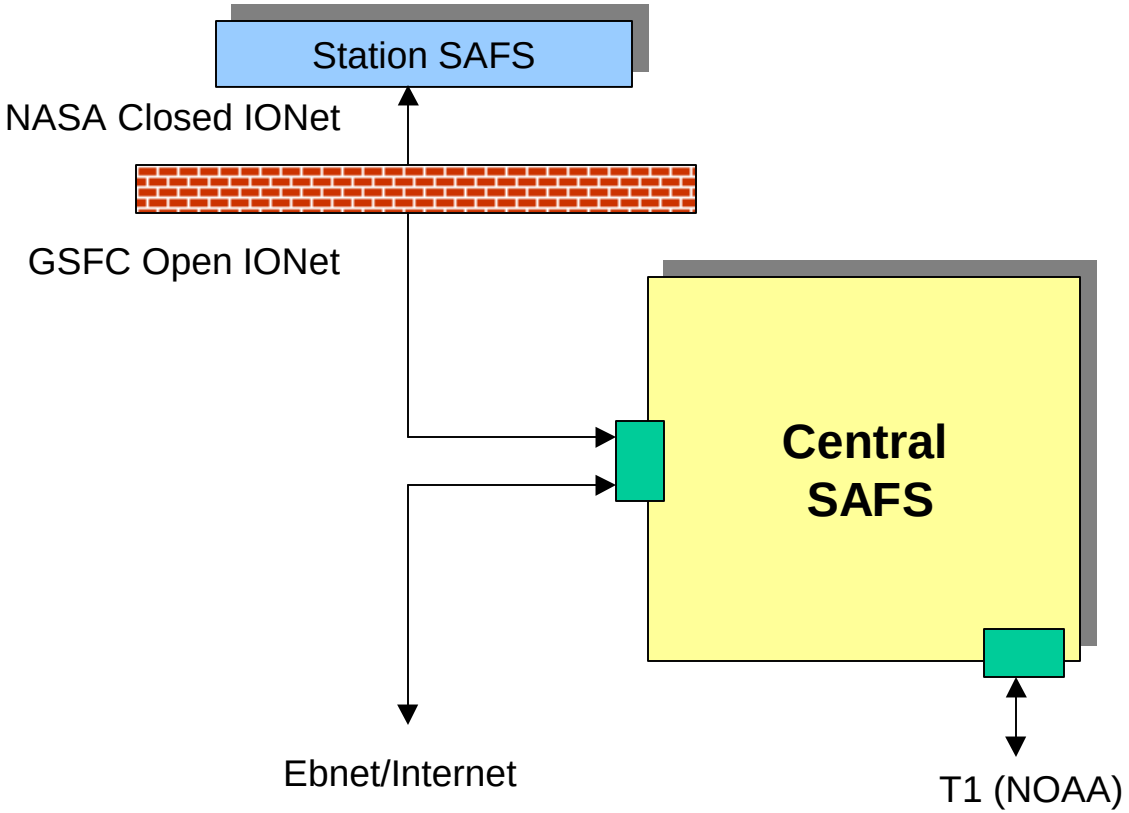


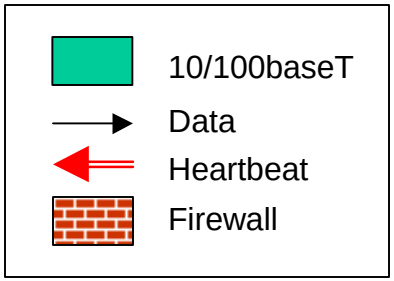


SAFS: Current Ground Station Network Topology

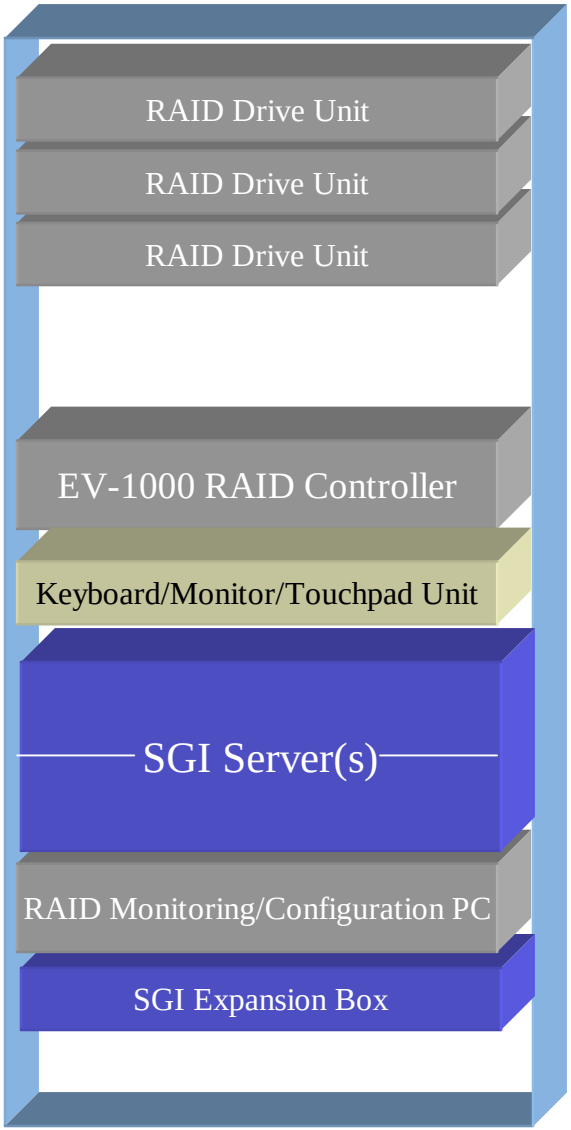


SAFS: Current Central SAFS Network Topology





SAFS: System Hardware Components



Current configurations:

Ground Station SAFS (AGS,MGS,SGS,WGS)
- DataDirect Networks EV-1000 RAID drive system
- SGI Origin 200 server(s) with one Ethernet card
- Industrial Computer Source keyboard/monitor/touchpad unit
- Spares available

Central SAFS (GSFC)
- DataDirect Networks EV-1000 RAID drive system
- SGI Origin 2000 server with two Ethernet cards
- Industrial Computer Source keyboard/monitor/touchpad unit
- Spares planned

Proposed configuration(s):

Ground Station SAFS (WGS)
- SGI Origin 200 server upgrade
  - increase RAM and CACHE memory
  - upgrade CPU's
  - add one FAST Ethernet card

Central SAFS (GSFC)
- SGI Origin 2000 server upgrade
  - increase RAM and CACHE memory
  - add CPU's

Non Ground Station SAFS (ASF)
- DataDirect Networks EV-1000 RAID drive system
- SGI Origin 200 server with one FDDI and three Fast Ethernet cards
- SGI Expansion Box
- Industrial Computer Source keyboard/monitor/touchpad unit

SAFS: Current Storage Capacity

Site	Current Total Capacity(MB)	Project Storage Requirements 1					Proposed Usage (MB)	Additional Required (MB)	Additional Recommended (MB) 2
		QuikSCAT (MB)	ADEOS II (MB)	Radarsat (MB)	SAGE III (MB)	EO-1 (MB)			
AGS	35,295	2,016				18,123	20,139		
SGS	35,311	2,016				18,123	20,139		
WGS	35,174	2,016	15,680		1,680	18,123	37,499		17,325
MGS	35,261	2,016				18,123	20,139		
ASF	88,367		54,880	24,000			78,880		22,065
Central	122,982	2,016	15,680		1,680	18,123	37,499		

Note:

1. Total project storage requirement = $\sum_{i=1,\#\ \text{file types}}$ (file size * file frequency * file retention)

2. Additional recommended to maintain storage at 40% above the proposed usage for maximum system performance.

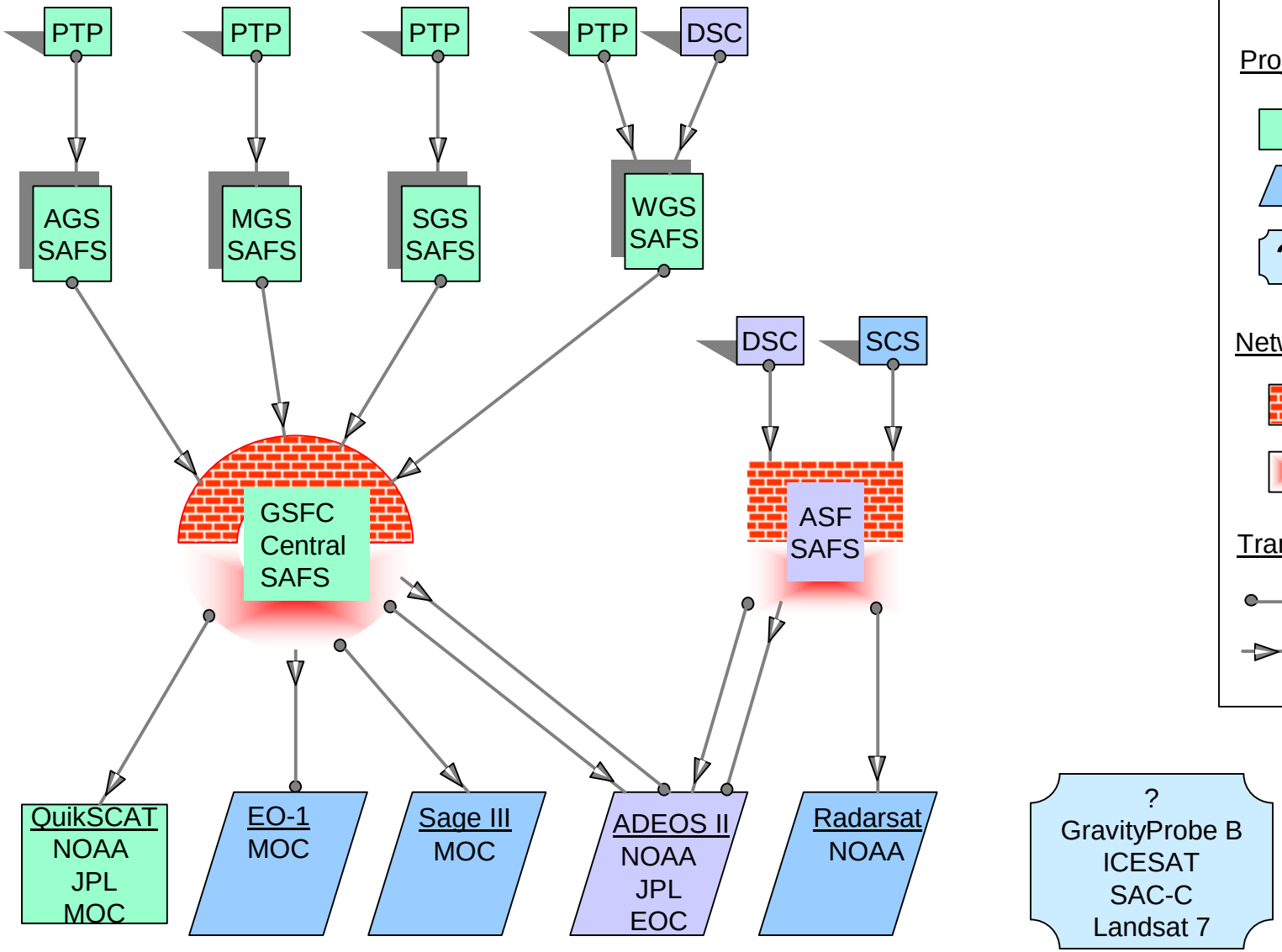
SAFS: Project File Sizes

Project	QuikSCAT		ADEOS II		Radarsat		Sage III		EO-1	
File	**Type**	**Size (MB)** 1	**Type/File**	**Size (MB)** 1	**Type**	Size (MB) 1	**Type**	**Size (MB)** 1	**Type**	**Size (MB)** 1
	HK1	3	AMSR/1	99.6	SAR 3	1000	RAW	60	VC1	222.0
	HK2	3	DCS/2	9.9					VC2	8.8
	SCI	30	DMS/4	4.8					VC3	216.0
			GLI/2	700.5					VC4	17.7
			HK/1	3.7					VC6	37.5
			ILAS/1	81.7					VC7	37.5
			SW/1	33.4					VC8	37.5
			VMS/2	29.4					VC9	37.5
			TED/1	16.7					VC11	222.0
									VC12	8.8
									VC14	17.7
Total	3	36	9	980	1	1000	1	60	11	863
Retention		4 days		4 days		2 days		14 days		7 days
	Site(s)	**Passes/day** 2	**Site(s)**	**Passes/day** 2	**Site(s)**	**Passes/day** 2	**Site(s)**	**Passes/day** 2	**Site(s)**	**Passes/day** 2
	AGS	14	WGS	4	ASF	6	WGS	2	AGS	3
	MGS	14	ASF	14			Central	2	MGS	3
	SGS	14	Central	14					SGS	3
	WGS	14							WGS	3
	Central	14							Central	3

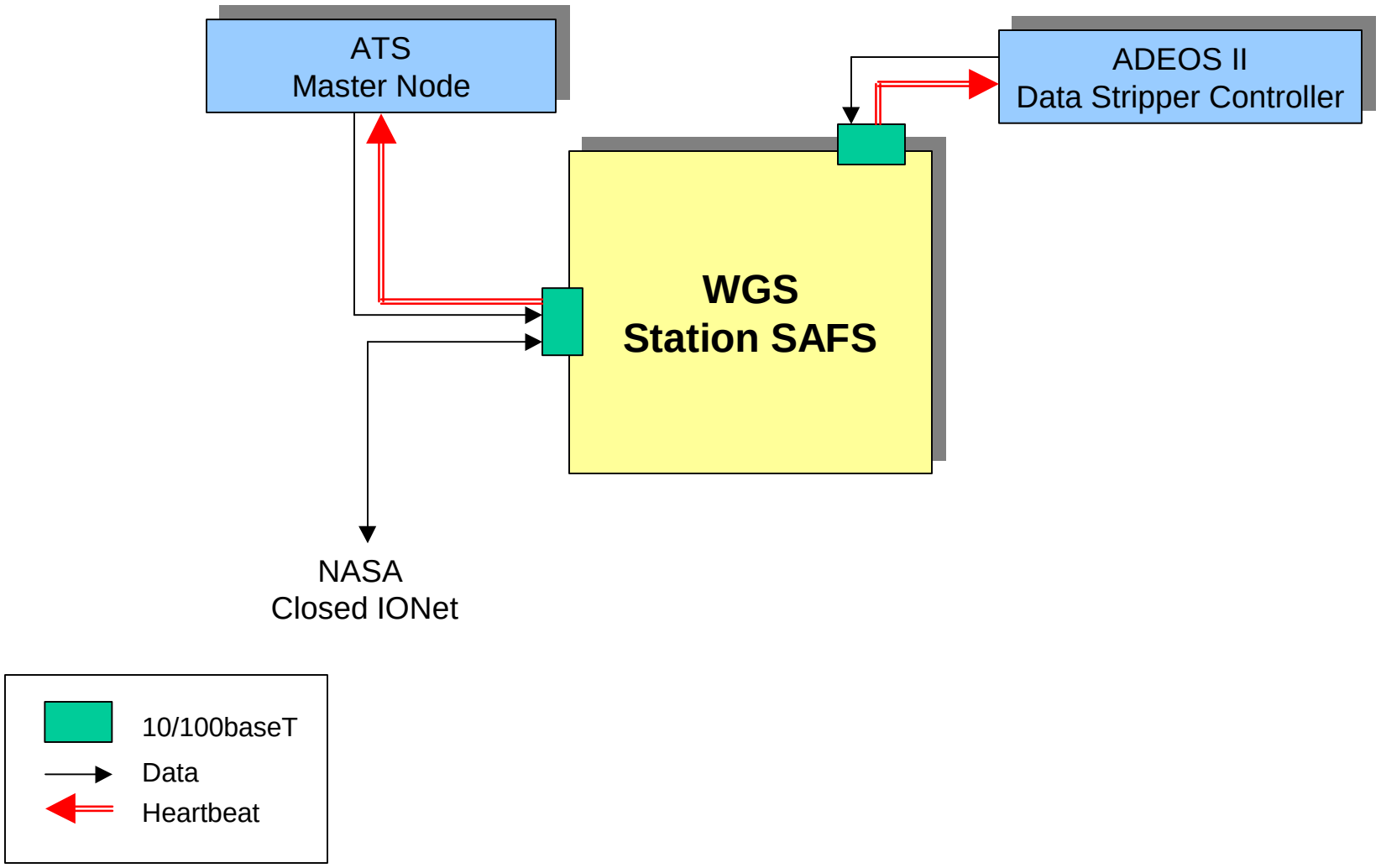
Note:

1. Maximum file sizes for each file type are being used for computing project storage requirements.
2. Number of passes/day are worst case. (example: all passes are taken at a single site)
3. Growth potential = 100%

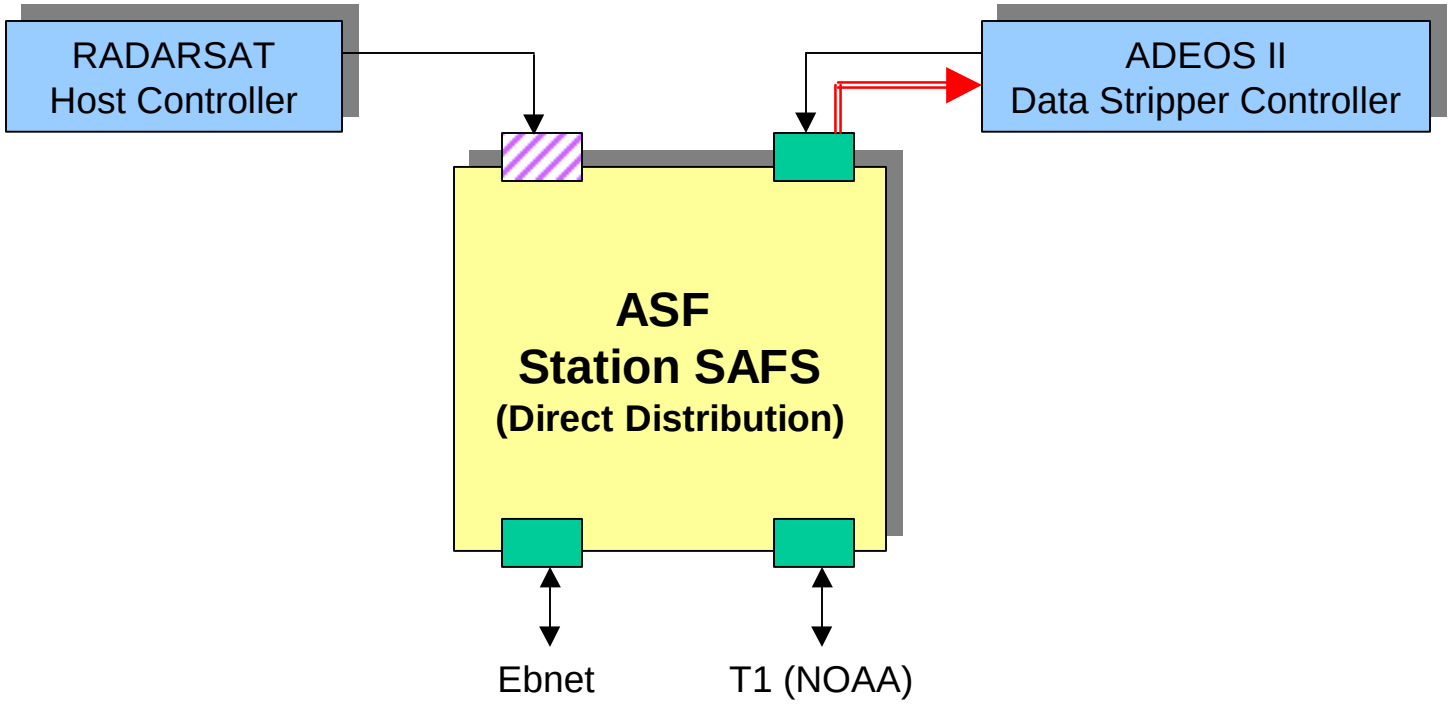
SAFS: Projected Configuration as of mid 1999

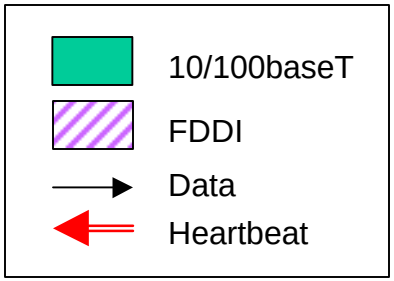


SAFS: Proposed WGS Network Topology

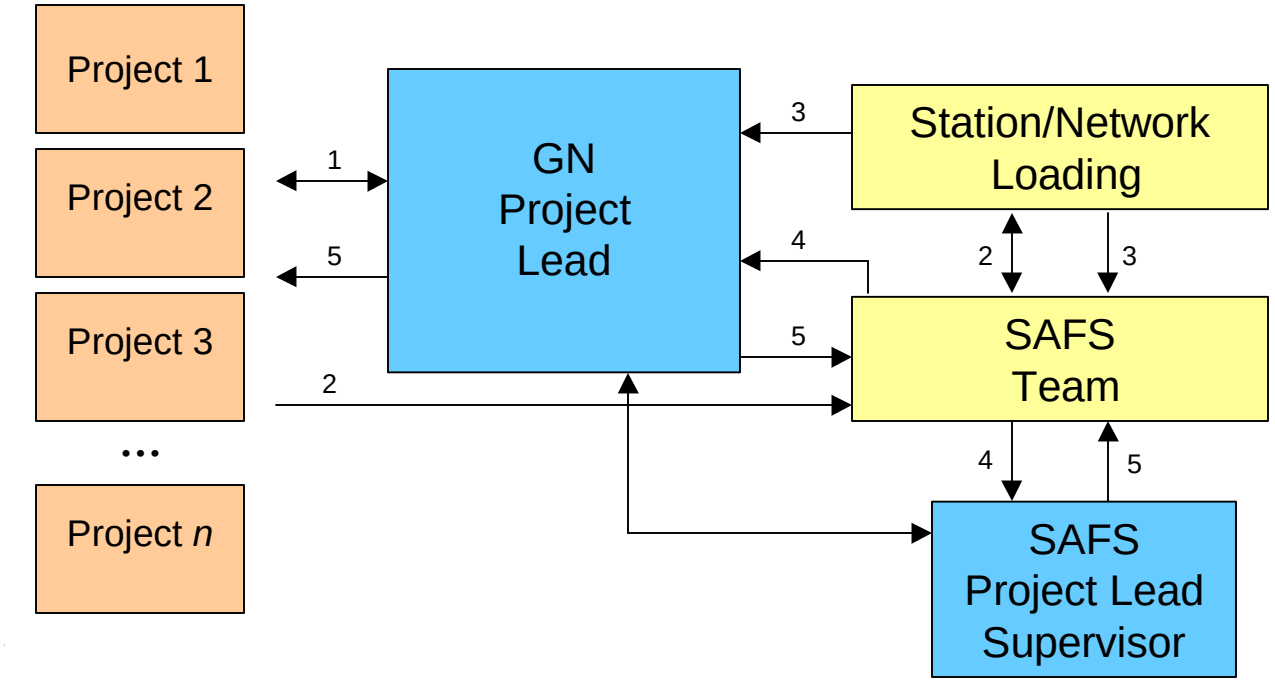


SAFS: Proposed ASF Network Topology





SAFS: New Project Approval Process



1. First contact from new project with permission for assessment.
2. Project requirements/resources identified.
3. External impact assessment and recommendations.
4. SAFS impact assessment and recommendations.
5. Approval/disapproval for new project support.

SAFS: Preliminary Project Information Form

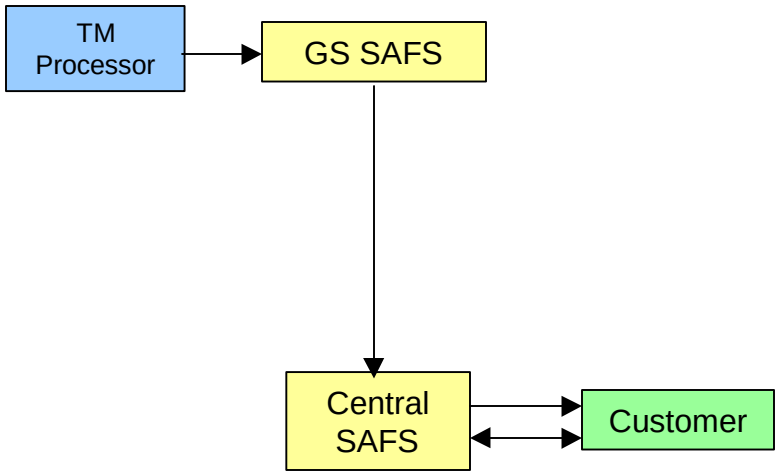
Project Name	ADEOS II					Launch Date						
Contact Name	Ron Forsythe					Phone/Fax	757-824-1357/824-1903					
Contact Email	Ronald.G.Forsythe.1@gsfc.nasa.gov											
File Type	AMS	DCS	DMS	GLI	HKM	ILA	SWM	TED	VMS			
Maximum File Size (MB)	99.6	9	2.7	369.5	3.7	81.7	20.2	16.7	14.7			
File Latency (AOS to file availability)	1 hr	2.5 hr		11 hr		1 hr	2.5 hr					
File Frequency (passes/day)	14/day											
File Retention (days)	4											
Metafiles	Check one:	YES	X	NO								
SAFS File Naming Used	Check one:	YES		NO	X							
Orbit Time (min/rev)												

Customers	NOAA	JPL	EOC		
Distribution: Ethernet, T1, Ebnet, Other	T1	Ebnet	Ebnet		
Transfer Method: push, pull	push	push	pull		
Transfer Protocol: FTP, FASTCopy	FASTCopy	FASTCopy	FTP		
Ground Stations	**AGS**	**MGS**	**SGS**	**WGS**	**ASF**
TM Proc: PTP, Data Stripper, Other				Data Stripper	Data Stripper
Distribution: Ethernet, T1, Ebnet, Other				Ethernet	Ethernet
Avg. Downlink Time					
Total Storage Req. *					

Other related information
ASF will distribute directly to customers (Type 3 method)
WGS will distribute from the Central SAFS (Type 2 method)

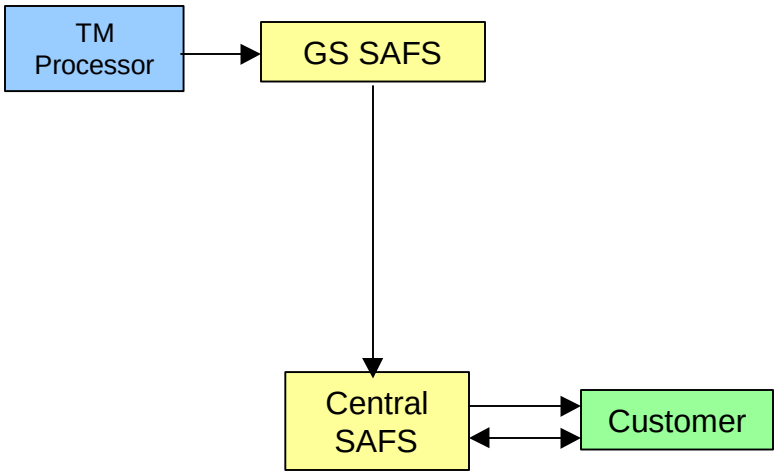
SAFS: Project File Naming Convention

Type 1: Distribution from the Central SAFS using SAFS file names.



Type 1 projects:
- QuikSCAT
- SAGE III
- EO-1

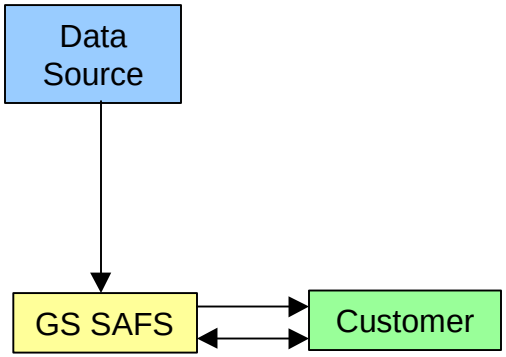
Type 2: Distribution from the Central SAFS using project specified file names.



Type 2 projects:
- ADEOS II - WGS

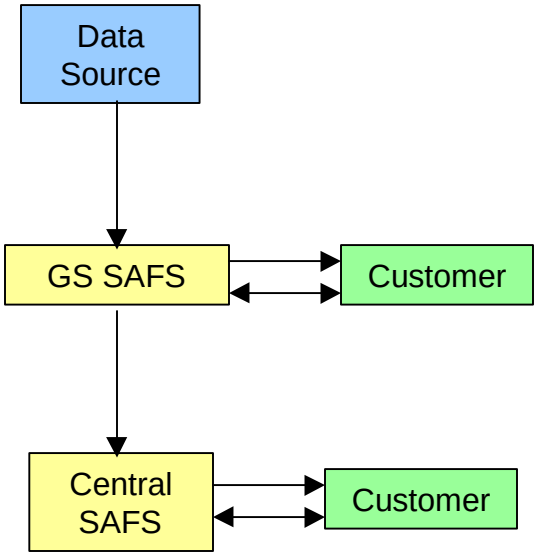
SAFS: Project File Naming Convention

Type 3: Direct distribution from the GS SAFS using project specified file names.



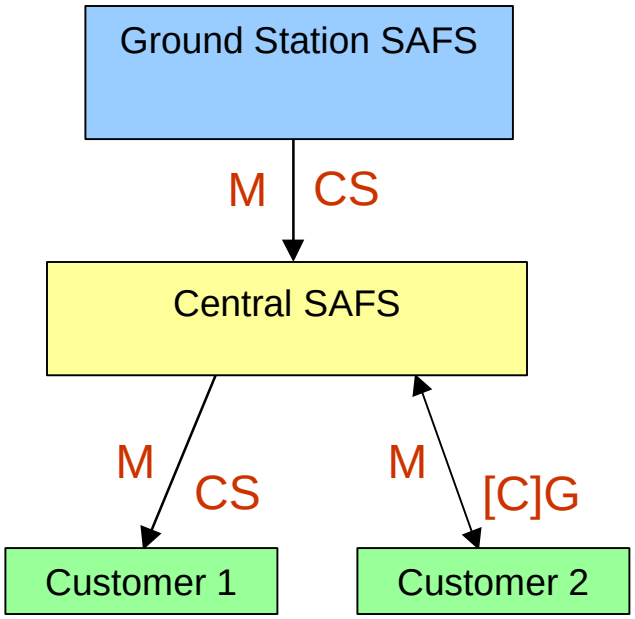
Type 3 projects:
- ADEOS II - ASF
- Radarsat

Type 4: Direct distribution from the GS SAFS and from the Central SAFS using project specified file names

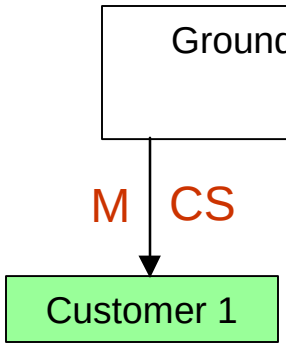


Type 4 projects:
- none

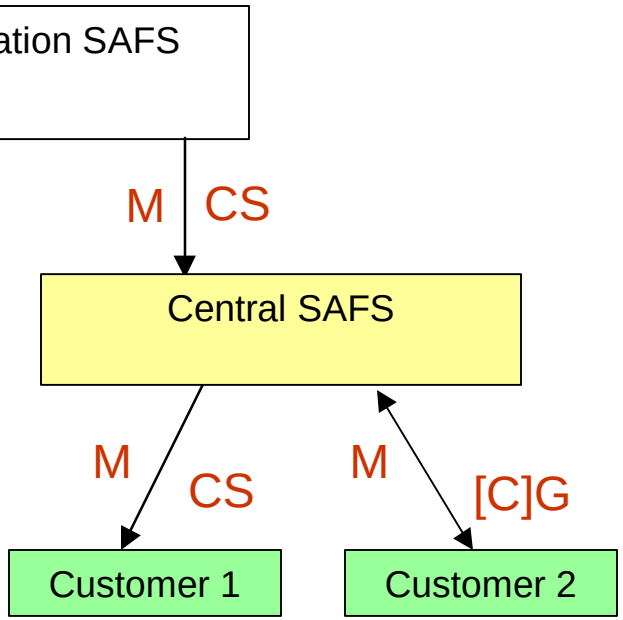
SAFS: Lab Test Environment



Type 1



Type 3



Type 2

Type 4

LEGEND
C = Use COTS product
G = Get data (PULL)
M = Mail notification
S = Send data (PUSH)

Type 1: Distribution from the Central SAFS using SAFS file names.
Type 2: Distribution from the Central SAFS using project specified file names.
Type 3: Direct distribution from the Ground Station SAFS using project specified file names.
Type 4: Direct distribution from the Ground Station SAFS and from the Central SAFS using project specified file names.

SAFS: Priority File Transfers

- Priority needed when files arrive simultaneously or arrive while another file is being transferred

- Proposal: Define 4 prioritization categories

  SPECIAL - for spacecraft or weather emergencies, or launch and early orbit activities

  HIGH - for files needing speediest delivery (ie, within an hour)

  MEDIUM - for files with normal delivery requirements (ie, within several hours)

  LOW - for files with least urgent delivery requirements (ie, within 1/2 day)

- There will be 2-3 levels within each priority category to allow for differences due to projects, file types, customer distributions, and latency requirements.

- To Be Determined:

  Who sets priorities at each site?

  Who sets priorities at the Central SAFS?

  Who can change priorities for special events?

SAFS: Proposed Priority Transfer Scheme

Level	Type	Description	Comment
1	SPECIAL	- Reserved exclusively for true spacecraft or terrestrial emergency - For unplanned events only	This priority should normally be held open, so that ground system always has a reserve "slot" for unplanned events - Consistant with NASA response to spacecraft emergency
2		- For termporary use only - Can be used for either planned or unplanned events	Can be used for "nominal" urgent needs - spacecraft community has equal access to this priority
3	HIGH	- Use for top-level shareholder missions for data with high perishablility - e.g. deliver as fast as possible	Three priority levels within "PRIORITY" level allow for mitigation across projects.
4		- Use for mid-level shareholder missions for data with high perishablility - e.g. deliver within fraction of an hour	
5		- Use for low-level shareholder missions for data with high perishablility - e.g. delivery within an hour	
6	MEDIUM	- Use for any mission data which is not needed quickly - e.g. delivery within several hours	Two priority levels within "ROUTINE" level allow for mitigation across projects.
7		- Use for any mission data which can tolerate slow delivery - e.g. delivery within 1/2 day	
8	LOW	- Use for non-shareholder missions willing to accept residual bandwidth.	Two priority levels within "BACKGROUND" level allow for mitigation across projects.
9		- Use for non-shareholder of experimental mission willing to guarantee non-impact to any other SAFS traffic	lowest level cannot interfere with any other file delivery

SAFS: Recommendations to Expedite Development

- Implement full RAID disk configuration for each SAFS system.
- Obtain CSOC maintenance/sustaining engineering/operations support.
- Streamline configuration control process

SAFS: Proposed Storage Capacity

Site	Proposed Total Capacity(GB)	Total Drives 50 GB	Total Drives 9 GB	Project Storage Requirements QuikSCAT (MB)	ADEOS II (MB)	Radarsat (MB)	SAGE III (MB)	EO-1 (MB)	Proposed Usage (MB)	Remaining Capacity (MB)
AGS	458	9	15	2,016				18,123	20,139	437,861
SGS	458	9	15	2,016				18,123	20,139	437,861
WGS	663	15	9	2,016	15,680		1,680	18,123	37,499	625,501
MGS	330	4	20	2,016				18,123	20,139	309,861
ASF	900	24	0		54,880	24,000			78,880	821,120
Central	900	24	0	2,016	15,680		1,680	18,123	37,499	862,501
		85	59							
Projected Project Usage				10,080	86,240	24,000	3,360	90,615		

Advantages:

1. Improves throughput with fully configured RAID system.
2. Requires only one hardware reconfiguration at each site, instead of once for each new project.
3. Saves time for development effort.

Maintenance/Operations/Sustaining engineering

- Interface with ground station and operations personnel, and customers.
- Perform troubleshooting on reported SAFS problems and initiate and coordinate vendor support calls when required.
- Perform regular hardware maintenance on all SAFS hardware including installation of SAFS hardware upgrades.
- Arrange for shipment of and perform field installation of SAFS systems and/or upgrades.
- Provide support for operations testing and project testing.
- Provide support during launch activities.
- Maintain maintenance contracts.
- Maintain and order spare parts .
- Perform daily inspection of system and project logs and report observed anomalies.
- Provide system administration on all operational SAFS systems including scheduling, coordinating and performing installation of operating system upgrades, patches and software.
- Perform regular health and security monitoring on all components of the SAFS system.
- Provide weekly reports on SAFS status.

SAFS: Possible Fail-over Options

1. Network degradation/problems:
   - SAFS/customer monitoring
   - WPS Link Controller (LC) notification
   - Network personnel notification

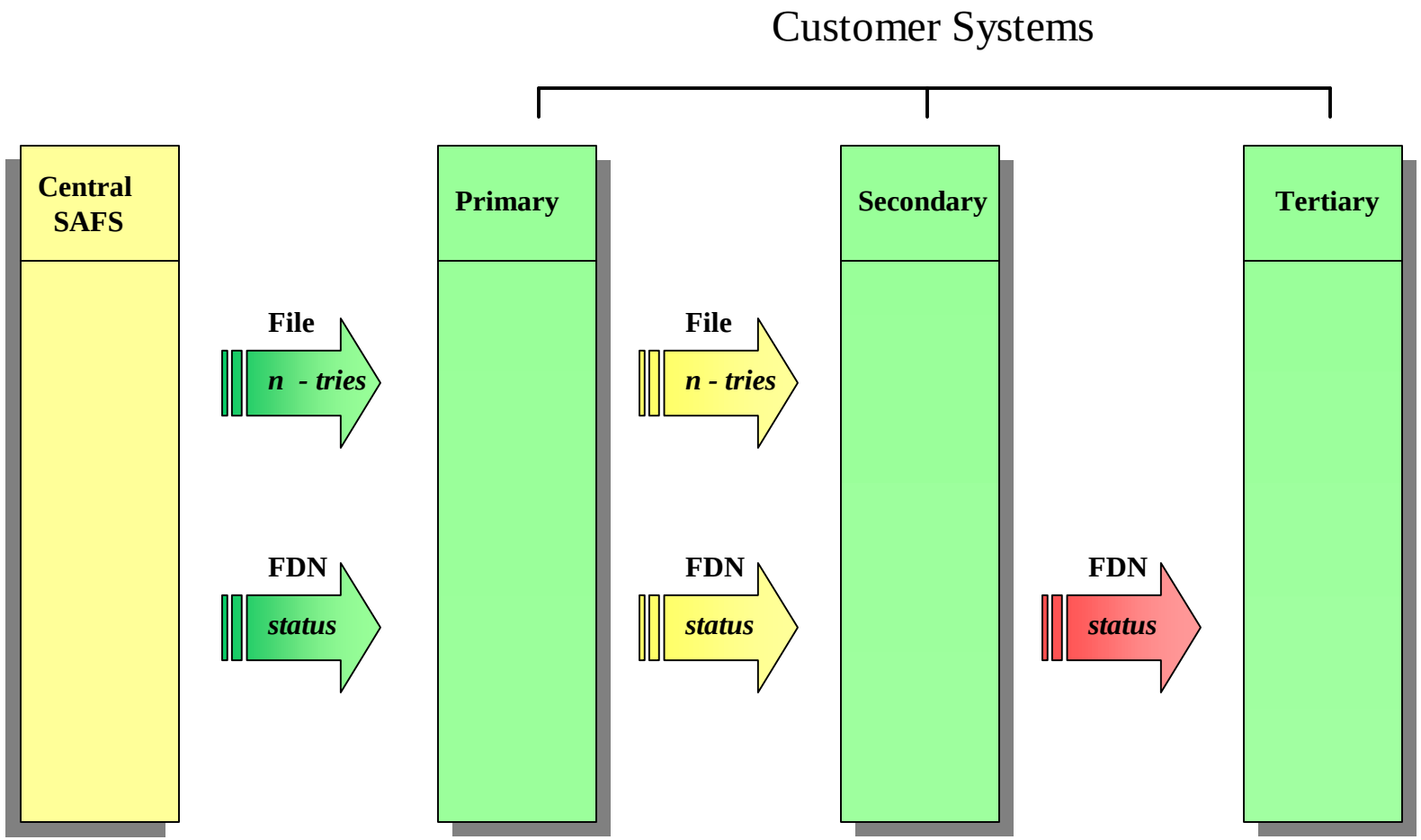
2. SAFS "push" failure
   - Retry ***n*** times
   - Use secondary destination
   - E-mail FDN with failure status
   - Customer "pulls" files

3. Ground Station (GS) SAFS system down
   - GS Master monitors SAFS heartbeat
   - Remote debugging
   - Contract maintenance support
   - Server Redundancy *
   - RAID failure: redirect storage to server with large drive *
   - Files re-routed to backup SAFS *

4. Central SAFS system down
   - GS SAFS/customer monitoring
   - WPS LC notification
   - Network Operations Center (NOC) personnel "hands and feet"
   - Mission critical support activation
   - Server Redundancy *
   - RAID failure: redirect storage to server with large drive *

* additional procurement needed

SAFS: Push Transfer Failover Options



SAFS: Sample of Pass Distribution Report

Report by TIMES

```
--- project date time: qst19990712171820 ---

          MOC      QPAC     QNRT     LAB      WGS      AGS      SGS      MGS
          ------   ------   ------   ------   ------   ------   ------   ----
hk1.dat   FP R0    FP R0                                         FP R0
hk1.mta   FP R0    FP R0                                         FP R0
hk2.dat            FP R0    FP R0                               FP R0
hk2.mta            FP R0    FP R0                               FP R0
sci.dat            FP R0    FP R0                               FP R0
sci.mta            FP R0    FP R0                               FP R0

-------------------------------------------------------------
```

...

LEGEND:

F = File delivery notification
- P = customer's primary system
- S = customer's secondary system

R = Receipt confirmation notice
- 0 = successful transfer
- 2 = error in transfer

URL: http://www.wff.nasa.gov/~web/safs/test/reportform.html

SAFS: Sample of Pass Distribution Report

Report by FILE TYPE

```
qst19990712

              002301p01hk1.mta:    DRN=  0, FDN=  3, RCN=  3
              002301p01hk1.dat:    DRN=  0, FDN=  3, RCN=  3
              002301p01hk2.dat:    DRN=  1, FDN=  3, RCN=  3
              002301p01hk2.mta:    DRN=  1, FDN=  3, RCN=  3
                                                  ......
              185841p01sci.mta:    DRN=  0, FDN=  3, RCN=  3
              185841p01sci.dat:    DRN=  0, FDN=  3, RCN=  3
-------------------------------------------------

Summary of GSFC Site Activity:

                AGS          0:    DRN=  0, FDN= 36, RCN= 36

                MOC          0:    DRN= 26, FDN=  0, RCN= 26
                MOC    PRIMARY:    DRN=  0, FDN= 26, RCN=  0

               QNRT          0:    DRN=  0, FDN=  0, RCN= 52
               QNRT    PRIMARY:    DRN=  0, FDN= 52, RCN=  0

               QPAC          0:    DRN=  0, FDN=  0, RCN= 78
               QPAC    PRIMARY:    DRN=  0, FDN= 78, RCN=  0

                SGS          0:    DRN=  0, FDN= 36, RCN= 36

                WGS          0:    DRN=  0, FDN=  6, RCN=  6
-------------------------------------------------
```

LEGEND:

DRN = Data Ready notification
FDN = File delivery notification
RCN = Receipt confirmation notice

SAFS: Sample of Station Latency Report

DRAFT: Under Construction

```
06/23/99 Times for Project qst on wgssafs:
-------------------------------------------------------------------
--

pass: 09:29:00

    TYPE          SIZE     AOS->GS     GS->C     2-MAILS     AOS->C
   hk1.dat:     5365206   00:17:19   00:00:18   00:00:10    00:17:37
   hk1.mta:         844   00:17:19   00:00:18   00:00:04    00:17:37
   hk2.dat:                    NA         NA         NA    NA
   hk2.mta:                    NA         NA         NA    NA
   sci.dat:                    NA         NA         NA    NA
   sci.mta:                    NA         NA         NA    NA
...................................................................
..

pass: 11:03:13

    TYPE          SIZE     AOS->GS     GS->C     2-MAILS     AOS->C
   hk1.dat:     2868852   00:18:06   00:00:14   00:00:07    00:18:20
   hk1.mta:         844   00:18:06   00:00:14   00:00:07    00:18:20
   hk2.dat:                    NA         NA         NA    NA
   hk2.mta:                    NA         NA         NA    NA
   sci.dat:                    NA         NA         NA    NA
   sci.mta:                    NA         NA         NA    NA
...................................................................
..
```

SAFS: Current/Planned SAFS Spares

Nomenclature	Currently On Site				Planned Distribution				Required to Order
	WGS	AGS	CSAFS	SGS	WGS	AGS	CSAFS	SGS	
SAFS/64MB Cache Module for Controller	1	1	0	1	1	1	0	1	3
SAFS/64MB Dual Cache Module for Controller	0	0	0	0	1	1	1	1	4
SAFS/9.1GB Ultra-Wide SCSI Drive Module	2	2	0	2	2	2	2	2	8
SAFS/Controller Unit Cooling Module	1	1	0	1	1	1	1	1	4
SAFS/Controller Unit Power Supply	1	1	0	1	1	1	1	1	4
SAFS/Fan, Cooling Module	1	1	0	1	1	1	1	1	3
SAFS/Power Supply Module	1	1	0	1	1	1	1	1	3
SAFS/Rackmount RAID Controller Module	0	1	0	1	1	1	1	1	4
SAFS/Transceiver for CS-1	1	1	0	1	1	1	1	1	1
SAFS/Ultra-Wide SCSI RAID Dual Controller	1	1	0	1	1	1	1	1	4
SAFS/Keyboard Monitor System	1	1	0	1	1	1	1	1	4
SAFS/SGI CD ROM Drive	0	0	0	1	1	1	1	1	3
SAFS/SGI Origin 200 Server System	0	0		1	1	1		1	2
SAFS/SGI Origin 2000 Server System			0				1		1
SAFS/SGI SCSI PCI Card	0	0	0	1	1	1	1	1	3

The "spares on site" numbers above are as of 6/29/99.

The "required to order" numbers are based on what already existed at the sites.